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<110> Raghuram Kalluri

<120> ANTI-ANGIOGENIC PROTEINS AND FRAGMENTS  
AND METHODS OF USE THEREOF

<130> 1440.1027-016

<140> US 10/032,221

<141> 2001-12-21

<150> PCT/US01/00565

<151> 2001-01-08

<150> US 09/543,371

<151> 2000-04-04

<150> US 09/335,224

<151> 1999-06-17

<150> US 60/126,175

<151> 1999-03-25

<150> US 60/089,689

<151> 1998-06-17

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Leu Leu Tyr Val Gln Gly Asn Glu Arg Ala His Gly Gln Asp Leu Gly  
35 40 45

acg gcc ggc agc tgc ctg cgc aag ttc agc aca atg ccc ttc ctg ttc 192  
 Thr Ala Gly Ser Cys Leu Arg Lys Phe Ser Thr Met Pro Phe Leu Phe  
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tgc aat att aac aac gtg tgc aac ttt gca tca cga aat gac tac tcg 240  
 Cys Asn Ile Asn Asn Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser  
 65 70 75 80

tac tgg ctg tcc acc cct gag ccc atg ccc atg tca atg gca ccc atc 288  
 Tyr Trp Leu Ser Thr Pro Glu Pro Met Pro Met Ser Met Ala Pro Ile  
 85 90 95

acg ggg gaa aac ata aga cca ttt att agt agg tgt gct gtg tgt gag 336  
 Thr Gly Glu Asn Ile Arg Pro Phe Ile Ser Arg Cys Ala Val Cys Glu  
 100 105 110

gcg cct gcc atg gtg atg gcc gtg cac agc cag acc att cag atc cca 384  
 Ala Pro Ala Met Val Met Ala Val His Ser Gln Thr Ile Gln Ile Pro  
 115 120 125

ccg tgc ccc agc ggg tgg tcc tcg ctg tgg atc ggc tac tct ttt gtg 432  
 Pro Cys Pro Ser Gly Trp Ser Ser Leu Trp Ile Gly Tyr Ser Phe Val  
 130 135 140

atg cac acc agc gct ggt gca gaa ggc tct ggc caa gcc ctg gcg tcc 480  
 Met His Thr Ser Ala Gly Ala Glu Gly Ser Gly Gln Ala Leu Ala Ser  
 145 150 155 160

ccc ggc tcc tgc ctg gag gag ttt aga agt gcg cca ttc atc gag tgt 528  
 Pro Gly Ser Cys Leu Glu Glu Phe Arg Ser Ala Pro Phe Ile Glu Cys  
 165 170 175

cac ggc cgt ggg acc tgc aat tac tac gca aac gct tac agc ttt tgg 576  
 His Gly Arg Gly Thr Cys Asn Tyr Tyr Ala Asn Ala Tyr Ser Phe Trp  
 180 185 190

ctc gcc acc ata gag agg agc gag atg ttc aag aag cct acg ccg tcc 624  
 Leu Ala Thr Ile Glu Arg Ser Glu Met Phe Lys Lys Pro Thr Pro Ser  
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acc ttg aag gca ggg gag ctg cgc acg cac gtc agc cgc tgc caa gtc 672  
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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Pro | Gln | Cys | Pro | Ser | Gly | Thr | Lys | Ile | Leu | Tyr | His | Gly | Tyr | Ser |
|     |     | 20  |     |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Leu | Leu | Tyr | Val | Gln | Gly | Asn | Glu | Arg | Ala | His | Gly | Gln | Asp | Leu | Gly |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Thr | Ala | Gly | Ser | Cys | Leu | Arg | Lys | Phe | Ser | Thr | Met | Pro | Phe | Leu | Phe |
|     |     | 50  |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Cys | Asn | Ile | Asn | Asn | Val | Cys | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     | 80  |     |
| Tyr | Trp | Leu | Ser | Thr | Pro | Glu | Pro | Met | Pro | Met | Ser | Met | Ala | Pro | Ile |
|     |     |     | 85  |     |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Thr | Gly | Glu | Asn | Ile | Arg | Pro | Phe | Ile | Ser | Arg | Cys | Ala | Val | Cys | Glu |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Ala | Pro | Ala | Met | Val | Met | Ala | Val | His | Ser | Gln | Thr | Ile | Gln | Ile | Pro |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Pro | Cys | Pro | Ser | Gly | Trp | Ser | Ser | Leu | Trp | Ile | Gly | Tyr | Ser | Phe | Val |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Met | His | Thr | Ser | Ala | Gly | Ala | Glu | Gly | Ser | Gly | Gln | Ala | Leu | Ala | Ser |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Pro | Gly | Ser | Cys | Leu | Glu | Glu | Phe | Arg | Ser | Ala | Pro | Phe | Ile | Glu | Cys |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |
| His | Gly | Arg | Gly | Thr | Cys | Asn | Tyr | Tyr | Ala | Asn | Ala | Tyr | Ser | Phe | Trp |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Leu | Ala | Thr | Ile | Glu | Arg | Ser | Glu | Met | Phe | Lys | Lys | Pro | Thr | Pro | Ser |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Thr | Leu | Lys | Ala | Gly | Glu | Leu | Arg | Thr | His | Val | Ser | Arg | Cys | Gln | Val |
|     |     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Cys | Met | Arg | Arg | Thr |     |     |     |     |     |     |     |     |     |     |     |
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| gtc | agc | atc | ggc | tac | ctc | ctg | gtg | aag | cac | agc | cag | acg | gac | cag | gag | 48 |
| Val | Ser | Ile | Gly | Tyr | Leu | Leu | Val | Lys | His | Ser | Gln | Thr | Asp | Gln | Glu |    |
| 1   |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |     |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| ccc | atg | tgc | ccg | gtg | ggc | atg | aac | aaa | ctc | tgg | agt | gga | tac | agc | ctg | 96 |
| Pro | Met | Cys | Pro | Val | Gly | Met | Asn | Lys | Leu | Trp | Ser | Gly | Tyr | Ser | Leu |    |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ctg | tac | ttc | gag | ggc | cag | gag | aag | gcg | cac | aac | cag | gac | ctg | ggg | ctg | 144 |
| Leu | Tyr | Phe | Glu | Gly | Gln | Glu | Lys | Ala | His | Asn | Gln | Asp | Leu | Gly | Leu |     |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gcg | ggc | tcc | tgc | ctg | gcg | cgg | ttc | agc | acc | atg | ccc | ttc | ctg | tac | tgc | 192 |
| Ala | Gly | Ser | Cys | Leu | Ala | Arg | Phe | Ser | Thr | Met | Pro | Phe | Leu | Tyr | Cys |     |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| aac | cct | ggt | gat | gtc | tgc | tac | tat | gcc | agc | cgg | aac | gac | aag | tcc | tac | 240 |
| Asn | Pro | Gly | Asp | Val | Cys | Tyr | Tyr | Ala | Ser | Arg | Asn | Asp | Lys | Ser | Tyr |     |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| tgg | ctc | tct | acc | act | gcg | ccg | ctg | ccc | atg | atg | ccc | gtg | gcc | gag | gac | 288 |
| Trp | Leu | Ser | Thr | Thr | Ala | Pro | Leu | Pro | Met | Met | Pro | Val | Ala | Glu | Asp |     |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gag | atc | aag | ccc | tac | atc | agc | cgc | tgt | tct | gtg | tgt | gag | gcc | ccg | gcc | 336 |
| Glu | Ile | Lys | Pro | Tyr | Ile | Ser | Arg | Cys | Ser | Val | Cys | Glu | Ala | Pro | Ala |     |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| atc | gcc | atc | gcg | gtc | cac | agt | cag | gat | gtc | tcc | atc | cca | cac | tgc | cca | 384 |
| Ile | Ala | Ile | Ala | Val | His | Ser | Gln | Asp | Val | Ser | Ile | Pro | His | Cys | Pro |     |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     |     | 125 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gct | ggg | tgg | cgg | agt | ttg | tgg | atc | gga | tat | tcc | ttc | ctc | atg | cac | acg | 432 |
| Ala | Gly | Trp | Arg | Ser | Leu | Trp | Ile | Gly | Tyr | Ser | Phe | Leu | Met | His | Thr |     |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gcg | gcg | gga | gac | gaa | ggc | ggt | ggc | caa | tca | ctg | gtg | tca | ccg | ggc | agc | 480 |
| Ala | Ala | Gly | Asp | Glu | Gly | Gly | Gly | Gln | Ser | Leu | Val | Ser | Pro | Gly | Ser |     |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     | 160 |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| tgt | cta | gag | gac | ttc | cgc | gcc | aca | cca | ttc | atc | gaa | tgc | aat | gga | ggc | 528 |
| Cys | Leu | Glu | Asp | Phe | Arg | Ala | Thr | Pro | Phe | Ile | Glu | Cys | Asn | Gly | Gly |     |
|     |     |     |     | 165 |     |     |     | 170 |     |     |     |     |     | 175 |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| cgc | ggc | acc | tgc | cac | tac | tac | gcc | aac | aag | tac | agc | ttc | tgg | ctg | acc | 576 |
| Arg | Gly | Thr | Cys | His | Tyr | Tyr | Ala | Asn | Lys | Tyr | Ser | Phe | Trp | Leu | Thr |     |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| acc | att | ccc | gag | cag | agc | ttc | cag | ggc | tcg | ccc | tcc | gcc | gac | acg | ctc | 624 |
| Thr | Ile | Pro | Glu | Gln | Ser | Phe | Gln | Gly | Ser | Pro | Ser | Ala | Asp | Thr | Leu |     |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |     |

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 Lys Ala Gly Leu Ile Arg Thr His Ile Ser Arg Cys Gln Val Cys Met  
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                           20                          25                          30  
 Leu Tyr Phe Glu Gly Gln Glu Lys Ala His Asn Gln Asp Leu Gly Leu  
                           35                          40                          45  
 Ala Gly Ser Cys Leu Ala Arg Phe Ser Thr Met Pro Phe Leu Tyr Cys  
                           50                          55                          60  
 Asn Pro Gly Asp Val Cys Tyr Tyr Ala Ser Arg Asn Asp Lys Ser Tyr  
  65                          70                          75                          80  
 Trp Leu Ser Thr Thr Ala Pro Leu Pro Met Met Pro Val Ala Glu Asp  
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 Glu Ile Lys Pro Tyr Ile Ser Arg Cys Ser Val Cys Glu Ala Pro Ala  
                           100                          105                          110  
 Ile Ala Ile Ala Val His Ser Gln Asp Val Ser Ile Pro His Cys Pro  
                           115                          120                          125  
 Ala Gly Trp Arg Ser Leu Trp Ile Gly Tyr Ser Phe Leu Met His Thr  
  130                          135                          140  
 Ala Ala Gly Asp Glu Gly Gly Gly Gln Ser Leu Val Ser Pro Gly Ser  
  145                          150                          155                          160  
 Cys Leu Glu Asp Phe Arg Ala Thr Pro Phe Ile Glu Cys Asn Gly Gly  
                           165                          170                          175  
 Arg Gly Thr Cys His Tyr Tyr Ala Asn Lys Tyr Ser Phe Trp Leu Thr  
                           180                          185                          190  
 Thr Ile Pro Glu Gln Ser Phe Gln Gly Ser Pro Ser Ala Asp Thr Leu  
                           195                          200                          205  
 Lys Ala Gly Leu Ile Arg Thr His Ile Ser Arg Cys Gln Val Cys Met  
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 Lys Asn Leu  
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aca acg aga ggc ttt gtc ttc acc cga cac agt caa acc aca gca att 96  
 Thr Thr Arg Gly Phe Val Phe Thr Arg His Ser Gln Thr Thr Ala Ile  
 20 25 30

cct tca tgt cca gag ggg aca gtg cca ctc tac agt ggg ttt tct ttt 144  
 Pro Ser Cys Pro Glu Gly Thr Val Pro Leu Tyr Ser Gly Phe Ser Phe  
 35 40 45

ctt ttt gta caa gga aat caa cga gcc cac gga caa gac ctt gga act 192  
 Leu Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr  
 50 55 60

ctt ggc agc tgc ctg cag cga ttt acc aca atg cca ttc tta ttc tgc 240  
 Leu Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys  
 65 70 75 80

aat gtc aat gat gta tgt aat ttt gca tct cga aat gat tat tca tac 288  
 Asn Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr  
 85 90 95

tgg ctg tca aca cca gct ctg atg cca atg aac atg gct ccc att act 336  
 Trp Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr  
 100 105 110

ggc aga gcc ctt gag cct tat ata agc aga tgc act gtt tgt gaa ggt 384  
 Gly Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr Val Cys Glu Gly  
 115 120 125

cct gcg atc gcc ata gcc gtt cac agc caa acc act gac att cct cca 432  
 Pro Ala Ile Ala Ile Ala Val His Ser Gln Thr Thr Asp Ile Pro Pro

| 130   | 135 | 140 |     |
|---|-----|-----|-----|
| tgt cct cac ggc tgg att tct ctc tgg aaa gga ttt tca ttc atc atg |     |     | 480 |
| Cys Pro His Gly Trp Ile Ser Leu Trp Lys Gly Phe Ser Phe Ile Met |     |     |     |
| 145   | 150 | 155 | 160 |
| ttc aca agt gca ggt tct gag ggc acc ggg caa gca ctg gcc tcc cct |     |     | 528 |
| Phe Thr Ser Ala Gly Ser Glu Gly Thr Gly Gln Ala Leu Ala Ser Pro |     |     |     |
|   | 165 | 170 | 175 |
| ggc tcc tgc ctg gaa gaa ttc cga gcc agc cca ttt cta gaa tgt cat |     |     | 576 |
| Gly Ser Cys Leu Glu Glu Phe Arg Ala Ser Pro Phe Leu Glu Cys His |     |     |     |
|   | 180 | 185 | 190 |
| gga aga gga acg tgc aac tac tat tca aat tcc tac agt ttc tgg ctg |     |     | 624 |
| Gly Arg Gly Thr Cys Asn Tyr Tyr Ser Asn Ser Tyr Ser Phe Trp Leu |     |     |     |
|   | 195 | 200 | 205 |
| gct tca tta aac cca gaa aga atg ttc aga aag cct att cca tca act |     |     | 672 |
| Ala Ser Leu Asn Pro Glu Arg Met Phe Arg Lys Pro Ile Pro Ser Thr |     |     |     |
|   | 210 | 215 | 220 |
| gtg aaa gct ggg gaa tta gaa aaa ata ata agt cgc tgt cag gtg tgc |     |     | 720 |
| Val Lys Ala Gly Glu Leu Glu Lys Ile Ile Ser Arg Cys Gln Val Cys |     |     |     |
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| Met Lys Lys Arg His   |     |     |     |
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<212> PRT

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|   |     |     |     |
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| 1   | 5   | 10  | 15  |
| Thr Thr Arg Gly Phe Val Phe Thr Arg His Ser Gln Thr Thr Ala Ile |     |     |     |
|   | 20  | 25  | 30  |
| Pro Ser Cys Pro Glu Gly Thr Val Pro Leu Tyr Ser Gly Phe Ser Phe |     |     |     |
|   | 35  | 40  | 45  |
| Leu Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr |     |     |     |
|   | 50  | 55  | 60  |
| Leu Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys |     |     |     |
| 65  | 70  | 75  | 80  |
| Asn Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr |     |     |     |
|   | 85  | 90  | 95  |
| Trp Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr |     |     |     |
|   | 100 | 105 | 110 |
| Gly Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr Val Cys Glu Gly |     |     |     |
|   | 115 | 120 | 125 |
| Pro Ala Ile Ala Ile Ala Val His Ser Gln Thr Thr Asp Ile Pro Pro |     |     |     |
|   | 130 | 135 | 140 |
| Cys Pro His Gly Trp Ile Ser Leu Trp Lys Gly Phe Ser Phe Ile Met |     |     |     |
| 145   | 150 | 155 | 160 |
| Phe Thr Ser Ala Gly Ser Glu Gly Thr Gly Gln Ala Leu Ala Ser Pro |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Gly | Ser | Cys | Leu | Glu | Glu | Phe | Arg | Ala | Ser | Pro | Phe | Leu | Glu | Cys | His |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |
| Gly | Arg | Gly | Thr | Cys | Asn | Tyr | Tyr | Ser | Asn | Ser | Tyr | Ser | Phe | Trp | Leu |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |
| Ala | Ser | Leu | Asn | Pro | Glu | Arg | Met | Phe | Arg | Lys | Pro | Ile | Pro | Ser | Thr |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Val | Lys | Ala | Gly | Glu | Leu | Glu | Lys | Ile | Ile | Ser | Arg | Cys | Gln | Val | Cys |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     | 240 |     |  |  |
| Met | Lys | Lys | Arg | His |     |     |     |     |     |     |     |     |     |     |     |  |  |
|     |     |     |     | 245 |     |     |     |     |     |     |     |     |     |     |     |  |  |

<210> 11  
 <211> 27  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> pET22b(+) forward oligonucleotide primer for  
 Tumstatin

<400> 11  
 cgggatccgg gtttgaaagg aaaacgt 27

<210> 12  
 <211> 27  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> pET22b(+) reverse oligonucleotide primer for  
 Tumstatin

<400> 12  
 cccaagcttt cagtgtcttt tcttcat 27

<210> 13  
 <211> 8  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Additional vector sequence added to protein

<400> 13  
 Met Asp Ile Gly Ile Asn Ser Asp  
 1 5

<210> 14  
 <211> 7  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Additional vector sequence added to protein

<400> 14



Lys Leu Ala Ala Ala Leu Glu  
1 5

<210> 15

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> pPICZaA forward oligonucleotide primer for  
Arresten

<400> 15

ttcgggaattc tctgttgatc acggcttc

28

<210> 16

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> pPICZaA reverse oligonucleotide primer for  
Arresten

<400> 16

tgctctagag gtgttcttct catacagact tggca

35

<210> 17

<211> 31

<212> DNA

<213> Artificial Sequence

<220>

<223> pPICZaA forward oligonucleotide primer for  
Canstatin

<400> 17

ttcgggaattc gtcagcatcg gctacctcct g

31

<210> 18

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> pPICZaA reverse oligonucleotide primer for  
Canstatin

<400> 18

gggggtacccc caggttcttc atgcacacct gg

32

<210> 19

<211> 244

<212> PRT

<213> Artificial Sequence

<220>

<223> Tumstatin (amino acids 1-244)

<400> 19

```
Pro Gly Leu Lys Gly Lys Arg Gly Asp Ser Gly Ser Pro Ala Thr Trp
 1           5           10           15
Thr Thr Arg Gly Phe Val Phe Thr Arg His Ser Gln Thr Thr Ala Ile
      20           25           30
Pro Ser Cys Pro Glu Gly Thr Val Pro Leu Tyr Ser Gly Phe Ser Phe
      35           40           45
Leu Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr
      50           55           60
Leu Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys
65           70           75           80
Asn Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr
      85           90           95
Trp Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr
      100          105          110
Gly Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr Val Cys Glu Gly
      115          120          125
Pro Ala Ile Ala Ile Ala Val His Ser Gln Thr Thr Asp Ile Pro Pro
      130          135          140
Cys Pro His Gly Trp Ile Ser Leu Trp Lys Gly Phe Ser Phe Ile Met
145          150          155          160
Phe Thr Ser Ala Gly Ser Glu Gly Thr Gly Gln Ala Leu Ala Ser Pro
      165          170          175
Gly Ser Cys Leu Glu Glu Phe Arg Ala Ser Pro Phe Leu Glu Cys His
      180          185          190
Gly Arg Gly Thr Cys Asn Tyr Tyr Ser Asn Ser Tyr Ser Phe Trp Leu
      195          200          205
Ala Ser Leu Asn Pro Glu Arg Met Phe Arg Lys Pro Ile Pro Ser Thr
      210          215          220
Val Lys Ala Gly Glu Leu Glu Lys Ile Ile Ser Arg Cys Gln Val Cys
225          230          235          240
Met Lys Lys Arg
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<210> 20

<211> 124

<212> PRT

<213> Artificial Sequence

<220>

<223> Tumstatin 333 (amino acids 2-125 of SEQ ID NO:10)

<400> 20

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Gly Leu Lys Gly Lys Arg Gly Asp Ser Gly Ser Pro Ala Thr Trp Thr
 1           5           10           15
Thr Arg Gly Phe Val Phe Thr Arg His Ser Gln Thr Thr Ala Ile Pro
      20           25           30
Ser Cys Pro Glu Gly Thr Val Pro Leu Tyr Ser Gly Phe Ser Phe Leu
      35           40           45
Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr Leu
      50           55           60
Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys Asn
65           70           75           80
Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr Trp
      85           90           95
Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr Gly
```

100 105 110  
 Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr Val  
 115 120

<210> 21  
 <211> 119  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Tumstatin 334 (amino acids 126-244 of SEQ ID  
 NO:10)

<400> 21  
 Cys Glu Gly Pro Ala Ile Ala Ile Ala Val His Ser Gln Thr Thr Asp  
 1 5 10 15  
 Ile Pro Pro Cys Pro His Gly Trp Ile Ser Leu Trp Lys Gly Phe Ser  
 20 25 30  
 Phe Ile Met Phe Thr Ser Ala Gly Ser Glu Gly Thr Gly Gln Ala Leu  
 35 40 45  
 Ala Ser Pro Gly Ser Cys Leu Glu Glu Phe Arg Ala Ser Pro Phe Leu  
 50 55 60  
 Glu Cys His Gly Arg Gly Thr Cys Asn Tyr Tyr Ser Asn Ser Tyr Ser  
 65 70 75 80  
 Phe Trp Leu Ala Ser Leu Asn Pro Glu Arg Met Phe Arg Lys Pro Ile  
 85 90 95  
 Pro Ser Thr Val Lys Ala Gly Glu Leu Glu Lys Ile Ile Ser Arg Cys  
 100 105 110  
 Gln Val Cys Met Lys Lys Arg  
 115

<210> 22  
 <211> 191  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Tum-1 (Tumstatin N53) (amino acids 54-244 of SEQ  
 ID NO:10)

<400> 22  
 Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr Leu Gly Ser Cys Leu  
 1 5 10 15  
 Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys Asn Val Asn Asp Val  
 20 25 30  
 Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr Trp Leu Ser Thr Pro  
 35 40 45  
 Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr Gly Arg Ala Leu Glu  
 50 55 60  
 Pro Tyr Ile Ser Arg Cys Thr Val Cys Glu Gly Pro Ala Ile Ala Ile  
 65 70 75 80  
 Ala Val His Ser Gln Thr Thr Asp Ile Pro Pro Cys Pro His Gly Trp  
 85 90 95  
 Ile Ser Leu Trp Lys Gly Phe Ser Phe Ile Met Phe Thr Ser Ala Gly  
 100 105 110  
 Ser Glu Gly Thr Gly Gln Ala Leu Ala Ser Pro Gly Ser Cys Leu Glu  
 115 120 125

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Phe | Arg | Ala | Ser | Pro | Phe | Leu | Glu | Cys | His | Gly | Arg | Gly | Thr | Cys |
| 130 |     |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Asn | Tyr | Tyr | Ser | Asn | Ser | Tyr | Ser | Phe | Trp | Leu | Ala | Ser | Leu | Asn | Pro |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Glu | Arg | Met | Phe | Arg | Lys | Pro | Ile | Pro | Ser | Thr | Val | Lys | Ala | Gly | Glu |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Leu | Glu | Lys | Ile | Ile | Ser | Arg | Cys | Gln | Val | Cys | Met | Lys | Lys | Arg |     |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     |     | 190 |     |

<210> 23

<211> 132

<212> PRT

<213> Artificial Sequence

<220>

<223> Tum-2 (amino acids 1-132 of SEQ ID NO:10)

<400> 23

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Gly | Leu | Lys | Gly | Lys | Arg | Gly | Asp | Ser | Gly | Ser | Pro | Ala | Thr | Trp |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Thr | Thr | Arg | Gly | Phe | Val | Phe | Thr | Arg | His | Ser | Gln | Thr | Thr | Ala | Ile |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Pro | Ser | Cys | Pro | Glu | Gly | Thr | Val | Pro | Leu | Tyr | Ser | Gly | Phe | Ser | Phe |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Leu | Phe | Val | Gln | Gly | Asn | Gln | Arg | Ala | His | Gly | Gln | Asp | Leu | Gly | Thr |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Leu | Gly | Ser | Cys | Leu | Gln | Arg | Phe | Thr | Thr | Met | Pro | Phe | Leu | Phe | Cys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Asn | Val | Asn | Asp | Val | Cys | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser | Tyr |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Trp | Leu | Ser | Thr | Pro | Ala | Leu | Met | Pro | Met | Asn | Met | Ala | Pro | Ile | Thr |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     |     | 110 |     |
| Gly | Arg | Ala | Leu | Glu | Pro | Tyr | Ile | Ser | Arg | Cys | Thr | Val | Cys | Glu | Gly |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     |     | 125 |     |     |
| Pro | Ala | Ile | Ala |     |     |     |     |     |     |     |     |     |     |     |     |
|     |     |     | 130 |     |     |     |     |     |     |     |     |     |     |     |     |

<210> 24

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Tum-3 (amino acids 133-244 of SEQ ID NO:10)

<400> 24

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Ala | Val | His | Ser | Gln | Thr | Thr | Asp | Ile | Pro | Pro | Cys | Pro | His | Gly |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Trp | Ile | Ser | Leu | Trp | Lys | Gly | Phe | Ser | Phe | Ile | Met | Phe | Thr | Ser | Ala |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Gly | Ser | Glu | Gly | Thr | Gly | Gln | Ala | Leu | Ala | Ser | Pro | Gly | Ser | Cys | Leu |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Glu | Glu | Phe | Arg | Ala | Ser | Pro | Phe | Leu | Glu | Cys | His | Gly | Arg | Gly | Thr |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Cys | Asn | Tyr | Tyr | Ser | Asn | Ser | Tyr | Ser | Phe | Trp | Leu | Ala | Ser | Leu | Asn |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Pro | Glu | Arg | Met | Phe | Arg | Lys | Pro | Ile | Pro | Ser | Thr | Val | Lys | Ala | Gly |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | 85  |     | 90  |     | 95  |     |     |     |     |     |     |     |     |     |     |
| Glu | Leu | Glu | Lys | Ile | Ile | Ser | Arg | Cys | Gln | Val | Cys | Met | Lys | Lys | Arg |
|     | 100 |     |     |     |     |     |     | 105 |     |     |     |     | 110 |     |     |

<210> 25  
 <211> 64  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Tum-4 (amino acids 181-244 of SEQ ID NO:10)

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | 25  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Glu | Glu | Phe | Arg | Ala | Ser | Pro | Phe | Leu | Glu | Cys | His | Gly | Arg | Gly | Thr |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Cys | Asn | Tyr | Tyr | Ser | Asn | Ser | Tyr | Ser | Phe | Trp | Leu | Ala | Ser | Leu | Asn |
|     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |
| Pro | Glu | Arg | Met | Phe | Arg | Lys | Pro | Ile | Pro | Ser | Thr | Val | Lys | Ala | Gly |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Glu | Leu | Glu | Lys | Ile | Ile | Ser | Arg | Cys | Gln | Val | Cys | Met | Lys | Lys | Arg |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

<210> 26  
 <211> 79  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Tum-5 (amino acids 54-132 of SEQ ID NO:10)

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | 26  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Asn | Gln | Arg | Ala | His | Gly | Gln | Asp | Leu | Gly | Thr | Leu | Gly | Ser | Cys | Leu |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Gln | Arg | Phe | Thr | Thr | Met | Pro | Phe | Leu | Phe | Cys | Asn | Val | Asn | Asp | Val |
|     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |
| Cys | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser | Tyr | Trp | Leu | Ser | Thr | Pro |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Ala | Leu | Met | Pro | Met | Asn | Met | Ala | Pro | Ile | Thr | Gly | Arg | Ala | Leu | Glu |
|     | 50  |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
| Pro | Tyr | Ile | Ser | Arg | Cys | Thr | Val | Cys | Glu | Gly | Pro | Ala | Ile | Ala |     |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     |     |

<210> 27  
 <211> 20  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> T1 (amino acids 1-20 of SEQ ID NO:10)

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | 27  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Pro | Gly | Leu | Lys | Gly | Lys | Arg | Gly | Asp | Ser | Gly | Ser | Pro | Ala | Thr | Trp |
| 1   |     |     | 5   |     |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Thr | Thr | Arg | Gly |     |     |     |     |     |     |     |     |     |     |     |     |
|     |     | 20  |     |     |     |     |     |     |     |     |     |     |     |     |     |

<210> 28

<211> 20  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> T2 (amino acids 54-73 of SEQ ID NO:10)

<400> 28  
Asn Gln Arg Ala His Gly Gln Asp Leu Gly Thr Leu Gly Ser Cys Leu  
1 5 10 15  
Gln Arg Phe Thr  
20

<210> 29  
<211> 20

<212> PRT  
<213> Artificial Sequence

<220>  
<223> T3 (amino acids 69-88 of SEQ ID NO:10)

<400> 29  
Leu Gln Arg Phe Thr Thr Met Pro Phe Leu Phe Cys Asn Val Asn Asp  
1 5 10 15  
Val Cys Asn Phe  
20

<210> 30  
<211> 20  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> T4 (amino acids 84-103 of SEQ ID NO:10)

<400> 30  
Asp Val Cys Asn Phe Ala Ser Arg Asn Asp Tyr Ser Tyr Trp Leu Ser  
1 5 10 15  
Thr Pro Ala Leu  
20

<210> 31  
<211> 19  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> T5 (amino acids 99-117 of SEQ ID NO:10)

<400> 31  
Ser Thr Pro Ala Leu Met Pro Met Asn Met Ala Pro Ile Thr Gly Arg  
1 5 10 15  
Ala Leu Glu

<210> 32  
<211> 19

<212> PRT  
<213> Artificial Sequence

<220>  
<223> T6 (amino acids 114-132 of SEQ ID NO:10)

<400> 32  
Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr Val Cys Glu Gly Pro  
1 5 10 15  
Ala Ile Ala

<210> 33  
<211> 88  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Tumstatin-45-132 (amino acids 45-132 of SEQ ID  
NO:10)

<400> 33  
Gly Phe Ser Phe Leu Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln  
1 5 10 15  
Asp Leu Gly Thr Leu Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro  
20 25 30  
Phe Leu Phe Cys Asn Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn  
35 40 45  
Asp Tyr Ser Tyr Trp Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met  
50 55 60  
Ala Pro Ile Thr Gly Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr  
65 70 75 80  
Val Cys Glu Gly Pro Ala Ile Ala  
85

<210> 34  
<211> 88  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Tumstatin-5-126-C-A (amino acids 45-132 of SEQ ID  
NO:10; alanine has been substituted for the  
cysteine residue at position 126 of the  
full-length Tumstatin molecule)

<400> 34  
Gly Phe Ser Phe Leu Phe Val Gln Gly Asn Gln Arg Ala His Gly Gln  
1 5 10 15  
Asp Leu Gly Thr Leu Gly Ser Cys Leu Gln Arg Phe Thr Thr Met Pro  
20 25 30  
Phe Leu Phe Cys Asn Val Asn Asp Val Cys Asn Phe Ala Ser Arg Asn  
35 40 45  
Asp Tyr Ser Tyr Trp Leu Ser Thr Pro Ala Leu Met Pro Met Asn Met  
50 55 60  
Ala Pro Ile Thr Gly Arg Ala Leu Glu Pro Tyr Ile Ser Arg Cys Thr  
65 70 75 80  
Val Ala Glu Gly Pro Ala Ile Ala

<210> 35  
 <211> 9  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> synthetic blocking peptide

<400> 35  
 Cys Asp Cys Arg Gly Asp Cys Phe Cys  
 1 5

<210> 36  
 <211> 5  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> synthetic blocking peptide

<400> 36  
 Cys Asn Gly Arg Cys  
 1 5

<210> 37  
 <211> 25  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> T7 (amino acids 74-98 of SEQ ID NO:10)

<400> 37  
 Thr Met Pro Phe Leu Phe Cys Asn Val Asn Asp Val Cys Asn Phe Ala  
 1 5 10 15  
 Ser Arg Asn Asp Tyr Ser Tyr Trp Leu  
 20 25

<210> 38  
 <211> 25  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> T7-mutant

<400> 38  
 Thr Met Pro Phe Met Phe Cys Asn Ile Asn Asn Val Cys Asn Phe Ala  
 1 5 10 15  
 Ser Arg Asn Asp Tyr Ser Tyr Trp Leu  
 20 25

<210> 39  
 <211> 27  
 <212> PRT



<213> Artificial Sequence

<220>

<223> T8 (amino acids 69-95 of SEQ ID NO:10; lysine has been substituted for the leucine residue at position 69 of the full-length Tumstatin molecule)

<400> 39

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gln | Arg | Phe | Thr | Thr | Met | Pro | Phe | Leu | Phe | Cys | Asn | Val | Asn | Asp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Val | Cys | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser |     |     |     |     |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |

<210> 40

<211> 27

<212> PRT

<213> Artificial Sequence

<220>

<223> T8-3

<400> 40

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gln | Arg | Phe | Thr | Thr | Met | Pro | Phe | Leu | Phe | Ser | Asn | Val | Asn | Asp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Val | Ser | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser |     |     |     |     |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |

<210> 41

<211> 19

<212> PRT

<213> Artificial Sequence

<220>

<223> TP3

<400> 41

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Leu | Phe | Cys | Asn | Val | Asn | Cys | Val | Cys | Asn | Phe | Ala | Ser | Arg | Asn |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Asp | Tyr | Ser |     |     |     |     |     |     |     |     |     |     |     |     |     |

<210> 42

<211> 27

<212> PRT

<213> Artificial Sequence

<220>

<223> P2

<400> 42

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gln | Arg | Phe | Thr | Thr | Met | Pro | Phe | Leu | Phe | Asp | Asn | Val | Asn | Asp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Val | Asp | Asn | Phe | Ala | Ser | Arg | Asn | Asp | Tyr | Ser |     |     |     |     |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |

<210> 43

<211> 27

<212> PRT

<213> Artificial Sequence

<220>

<223> Scrambled peptide SP1

<400> 43

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Asn | Met | Ser | Arg | Asn | Val | Phe | Phe | Asp | Cys | Thr | Ser | Phe | Pro | Val |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Cys | Gln | Lys | Phe | Leu | Asn | Asp | Thr | Arg | Asn | Tyr |     |     |     |     |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |

<210> 44

<211> 27

<212> PRT

<213> Artificial Sequence

<220>

<223> Scrambled peptide SP2

<400> 44

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Phe | Asn | Cys | Val | Lys | Asn | Tyr | Gln | Arg | Leu | Asp | Phe | Thr | Ser | Arg |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Phe | Val | Met | Asp | Ser | Cys | Ala | Asn | Phe | Pro | Asn |     |     |     |     |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |

<210> 45

<211> 41

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<223> X at position 1 to 17 is any amino acid

<223> X at position 2 is F or K

<223> X at position 5 is C, S or D

<223> X at position 9 is D or C

<223> X at position 11 is C, S or D

<223> X at position 14 is any amino acid

<400> 45

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Xaa | Xaa | Leu | Phe | Xaa | Asn | Val | Asn | Xaa | Val | Xaa | Asn | Phe | Xaa |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     |

<210> 46

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 46

Thr Thr Met Pro

1

<210> 47

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 47

Phe Thr Thr Met Pro

1

5

<210> 48

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 48

Arg Phe Thr Thr Met Pro

1

5

<210> 49

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 49

Gln Arg Phe Thr Thr Met Pro

1

5

<210> 50

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 50

Leu Gln Arg Phe Thr Thr Met Pro

1

5

<210> 51

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 51

Lys Gln Arg Phe Thr Thr Met Pro

1

5

<210> 52

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 52

Ala Ser Arg Asn

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<210> 53

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 53

Ala Ser Arg Asn Asp

1

5

<210> 54

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 54

Ala Ser Arg Asn Asp Tyr

1

5

<210> 55

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> Generic peptide

<400> 55

Ala Ser Arg Asn Asp Tyr Ser

1

5

<210> 56

<211> 8  
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<220>  
<223> Generic peptide

<400> 56  
Ala Ser Arg Asn Asp Tyr Ser Tyr  
1 5

<210> 57  
<211> 9  
<212> PRT  
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<220>  
<223> Generic peptide

<400> 57  
Ala Ser Arg Asn Asp Tyr Asp Tyr Trp  
1 5

<210> 58  
<211> 10  
<212> PRT  
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<220>  
<223> Generic peptide

<400> 58  
Ala Ser Arg Asn Asp Tyr Ser Tyr Trp Leu  
1 5 10